

WITH THE TWENTIETH CENTURY WONDER WORKERS

Dating Civilization Back More Than Ten Thousand Years

ARTHUR EVANS, president of the British Association for Science, has just delivered the annual address before that body and has made some interesting statements regarding the time when civilization began.

Dr. Arthur points to many recent discoveries made by archaeologists in

Cave were executed on the ceilings of inner vaults and galleries where the light of day has never penetrated. "Such was the level of artistic attainment in southwestern Europe at a modest estimate some ten thousand years earlier than the most ancient monuments of Egypt or Chaldea. Nor is this an isolated phenomenon. One by one characteristic, both spiritual and material, that had been formerly

gradual evolution on Cretan soil of a complete system of writing from its earliest pictographic shape through a conventionalized hieroglyphic to a linear stage of great perfection. In addition to inscribed sealings and other records some 2,000 clay tablets have now come to light, mostly inventories or contracts, for though the script itself is still undeciphered the pictorial figures that often appear on these documents supply a valuable clue to their contents.

"The numeration also is clear, with figures representing sums up to 10,000. The inscribed sealings, signed, countermarked and countersigned by controlling officials, give a high idea of the elaborate machinery of government and administration under the Minoan rulers.

"The minutely organized legal conditions to which this points confirm the later traditions of Minoan, the great law giver of prehistoric Crete, who, like Hammurabi and Moses, was said to have received the law from the God of the Sacred Mountain. The clay tablets themselves were certainly due to Oriental influences, which made them selves perceptible in Crete at the beginning of the late Minoan age and may have been partly resultant from the reflex action of Minoan colonization in Cyprus.

"From this time onward Eastern elements are more and more traceable in Cretan culture and are evidenced by such phenomena as the introduction of chariots—themselves perhaps more remotely of Aryan-Iranian derivation—and by the occasional use of cylinder seals.

"The Minoan culture of primeval culture was thus already kindled in other world, and so far as our present knowledge goes, it was in the southwestern part of our continent, on the eastern shore of the Aegean, that it shone its brightest. After the great strides in human progress already made at that remote epoch it is hard, indeed, to understand what it was that still delayed the rise of European civilization in its higher shape. Yet it had to wait for its fulfillment through many millennia.

"The gathering shadows thickened and the darkness of a long night fell, not on that favored region alone, but throughout the wide area where the remainder of man had ranged. Still the question rises—as yet imperfectly answered—where there no ray runners to pass on elsewhere the lighted torch?

"It is a commonplace of archaeology that the culture of the neolithic peoples throughout a large part of central, northern and western Europe—like the newly domesticated species possessed by them—is Euraasiatic in type. So too, in southern Greece and the Aegean world we meet with a form of neolithic culture which must be essentially regarded as a prolongation of that of Asia Minor.

"The continuous history of the neolithic age is carried back at Knossos to an earlier epoch than is represented in the Aegean world. It is geographically related areas on the Greek and Anatolian side. But sufficient materials for comparison exist to show that the Cretan branch belongs to a vast province of primitive culture that extended from southern Greece and the Aegean islands throughout a wide area of Asia Minor and probably still farther afield.

"To-day we are able to trace the line of the neolithic culture, which has been shown that if the germ of a foot be removed and planted anywhere on the body it will develop into a fully formed foot, with all the toes. Many experiments along this line have demonstrated the fact that an organ will develop fully, even though removed from its proper place.

"The transplantation of bits of skin to cover injured parts was practiced by the Hindus ages ago. It was rediscovered in comparatively recent times. It has proved a great blessing to mankind. It is now held that the transplanted skin does not actually take root but is used by the body as a basis for growing its own new skin.

"Modern surgery has achieved still greater triumphs in the transplanting of bones, and we can now insert pieces of bone three inches long and secure growth in place. Lexer has even gone so far as to replace an entire knee joint with success. The transplanting of inner organs, such as salivary glands, milk glands, kidneys, etc., has been performed with frequent success. Of course many experiments on animals preceded the successful operations on men and women.

"The transplanting of kidneys has been done by Enderlin, Borst and Unger. Unger has succeeded in removing both kidneys from a bulldog and immediately substituting the kidneys of a fox terrier. The new kidneys took their function promptly and the dog seemed to suffer little from the shock. In Berlin a diseased kidney was removed from a young woman and the kidney of an anthropoid ape substituted successfully.

"Many operations of this kind are being performed in the world's hospitals, and if Carrel proves that he can preserve healthy organs until needed every laboratory and hospital will soon be compelled to keep a stock of skin, kidneys and various glands as well as other organs to supply the needs of suffering humanity. The principle of transplantation is now accepted as proved; all that remains to work out is the detail of methods, which must be carefully determined to avoid unnecessary delays or shocks.

tration on the signs of the great days of Mycenae. Even the lyre to which the minstrel sang was a Minoan invention. "For, if we turn to the side of religion, the Greek temple seems to have sprung from a Minoan hall; its earliest pediment schemes are adaptations from the Minoan tympanum, such as we see in the Lions' Gate. The most archaic figures of the Hellenic goddesses, like the Spartan Orthia, have the attributes and attendant animals of the great Minoan mother.

"Some elements of the old culture were taken over on the soil of Hellas. Others which had been crushed out in their old centres survived in the more eastern shores and islands formerly dominated by Minoan civilization, and were carried back by Phoenician or Ionian intermediaries to their old homes. In spite of the overthrow which about the twelfth century before our era fell on the old Minoan dominion and the onrush of the new conquerors from the north, much of the old tradition still survived to form the base of the later civilization of Greece. Once more, through the darkness the lighted torch was carried on, the first glimmering flame of which had been painfully kindled by the old cave dwellers in that earlier paleolithic world.

"The Roman Empire, which in turn appropriated the best that Greece had received from Minoan Crete, placed civilization on a broader basis by welding together heterogeneous ingredients and promoting a cosmopolitan ideal. If even the primeval culture of the remainder age embraced more than one race and absorbed extraneous elements from many sides, how much more is that the case with our own, which grew out of the Greco-Roman!

"Civilization in its higher form today, though highly complex, forms essentially a unitary mass. It has no longer to be sought out in separate

is practically inexhaustible in the living forth of energy. Strutt has calculated that one piece of thorium was at least 200 million years old, and that all that time this radioactive substance has been giving off its energy.

"It is a law of physics that energy cannot be created, whether it is expressed in force, light, heat or electricity, all of which are interchangeable. The old problem before the manufacturer, a rather gathering—for he can only concentrate, not make—of radium is a set out a huge mass of radioactive or the concentrated essence, or the combined radioactivity of the entire mass.

"It is not yet twenty years since Marie and her wife discovered radium in 1898, and possibly in the course of years more speedy and economical methods of extracting or concentrating radium will be found, but with all the improvements which have been made as quickly as possible. The old problem before the manufacturer, a rather gathering—for he can only concentrate, not make—of radium is a set out a huge mass of radioactive or the concentrated essence, or the combined radioactivity of the entire mass.

"There are several methods in use, all of which require dealing with tons of ore to get minute fragments of radium. Some use first the sulphuric acid, others use an alkali leach, and then the ore is acid leached, and then the ore must be fused with material which

luminous centres, shining like planets through the surrounding night. Still less is it the property of one privileged country or people. Many are the tongues of mortal men, its votaries, like the immortals, speak a single language. Throughout the whole vast area illumined by its quickening rays, its workers are interdependent and pledged to a common cause."

Islands alone, where a law has been passed forbidding the use of polished rice, with the result that beriberi has almost almost disappeared. President Taft declared that the disease has been stamped out by this provision alone.

"Dr. Hensen has reported that the disease of beriberi was very common in a leper colony in Ceylon until this discovery was made, but that after the use of unpollished rice was made compulsory no deaths occurred from this disease. When these sufferings from beriberi had been stamped out by this provision alone.

"Punk finds that these remarkable substances exist in very minute quantities, but may act very powerfully in altering foods chemically when in the body. The vitamins have been chiefly located in the outer layers of grains, not in the starchy centre, and he therefore claims that beriberi is due to eating polished rice and pellagra to eating milled corn.

"Punk attributes scurvy, which so frequently develops when men are limited in their food to dried and pickled meats, to the fact that the processing seems to destroy the vitamin meats. He finds vitamins exist in fresh fruits and especially in uncooked vegetables, notably potatoes, the juice of which is considered a specific for scurvy.

"The lack of vitamins produces a lack of nitrogen starvation, which is overcome by feeding proteins as well as vitamins. He holds that diet of his rich chemical character helps materially in overcoming tuberculosis or preventing it.

"Prof. Punk has ascertained after years of investigation that vitamins are soluble in water and alcohol and that they are destroyed when the temperature is raised to more than 130 degrees centigrade. He succeeded in isolating the vitamins from rice, yeast and other sources, so that he had an antidote for the various diseases arising from lack of these life giving elements. He found that in times there was 1 in 100,000 parts of the fruit, and the vitamin of lime has proved a great boon to sufferers from scurvy and beriberi.

"The discovery that the outer layer of rice held the vitamins has saved thousands of lives in the Philippine

It is because tons of ore are needed for the production of a grain of radium, and because many processes have to be gone through, entailing enormous labor, that a milligramme of radium was worth \$120 at the latest quotation.

In 1915 it was estimated that there was only one-quarter of a pound of radium known to exist in all the world in the shape in which it can be utilized for medical purposes. A bit half the size of a pinhead is valued at \$5,000, and from the point of view of cost of production it is worth it.

From the law of efficiency and force the value of radium is incalculable, for

helps to break it up. The latest method utilizes nitric acid, producing a radium-barium sulphate. The plant in Farnox Valley, Colorado, deals with carnotite, in which there is a large quantity of uranium oxide.

To give an idea of the many processes through which the ore must go before radium is secured, it is only necessary to pass over a few details. The ore is first ground up fine, and then leached with strong hot nitric acid. The product is next washed in a

weaker acid solution, and again washed with not distilled water. When it has been filtered what comes through the filter is diluted with water, and sodium hydroxide is added so that radium-barium sulphate remains. There is still further treatment and then the sulphates are put into molten pans and dried in a hot air oven. Nothing follows, yielding a sulphate free from impurities.

"When this is placed with carbon in an electric or oil furnace, and the sulphide is once more treated with hydrochloric acid, becoming radium-barium chloride, from which the radium chloride is extracted by crystallization. Then the radium chloride and barium chloride are treated with ammonium carbonate and the carbonates secured

for the great cost of the radium when secured. It is now claimed, though it has not been proved to the satisfaction of some critics, that radium can be produced in the United States for something less than \$20,000 per gram, which is less than half of what it cost in the open market two years ago.

It should not be forgotten in trying to explain the cost of radium that it costs about \$100 per gram, and that it is now valued at about \$120 per gram. There is another reason, aside from

escape, or, rather, make itself felt in the room under the safe. There is no thought of stopping the emanations, for that has heretofore proved impossible, and the emanations of radium will outlast many generations, so why economize in a practically inexhaustible source of energy?

The extraction of radium, properly considered, is therefore only one of the concentration of all of the stored up energy in the ore into the smallest possible unit, and this may explain why it is so costly.

Two hundred hundredweight of pitchblende balanced by two large elephants and a baby elephant to give an idea of the raw material required to produce one gram of radium. Alpha, Beta and Gamma rays of radium, indicated by dots, dashes and curves respectively. On the left all the rays combined, then the Alpha rays stopped by a thin strip of metal, then Alpha and Beta rays stopped by thick plate of metal.

Why a Bit of Radium Half the Size of a Pin Head Costs \$5,000

that of production, which will go far toward explaining the value of radium. Just because there is so great a demand for it all the world over the market value is great, as is the case with any commodity of which the supply is very limited and for which the need is great.

Radium is being used for treating many diseases, from cancer all down the line to minor skin affections and inoperable diseases. Study of radium itself has shown that there are three main streams of rays emanating from a bit of radium. They have been called Alpha, Beta and Gamma rays. If a magnet be held near a bit of radium it will attract the Beta rays most strongly, the Alpha rays next, but the Gamma rays not at all. It is of the utmost importance to control these various rays, for while one kind are adapted to treat affections, another may be required for a second, while the first should be shut off. It has been found by experiment that a thin sheet of metal, or even a sheet of paper, will shut off the Alpha rays, a much thicker piece of metal is needed to shut off the Beta rays, and the Gamma rays will pass through anything but lead, and that must be of considerable thickness to shut them off.

A safe for holding radium has therefore been constructed of very heavy walls of lead inside the steel chamber, so that the radium does not

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are dissolved in hydrochloric acid and are evaporated, giving bromide crystals. These crystals are then sealed up in glass tubes, and finally by what is termed "higher fractionation" the radium is separated in the form of radium bromide.

It has been figured that the radium in the ore is exactly or nearly 1-200,000,000 of the bulk, so it is easy to see that having to pass tons of material through so many delicate processes, in order to secure what any one would call a speck of dust, is a fair reason

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Greek vase painting of best period, showing achievement of Greek art.

Europe to prove that civilization is many thousands of years older than has been believed heretofore. He finds that there was a high state of civilization in southwestern Europe at least ten thousand years before the earliest historic monuments of Egypt and Babylonia, which have up to this time meant earliest civilization in the minds of men. Among other things he said:

"In recent years in Egypt, in Babylonia, in ancient Persia, in the central Asian deserts, or, come nearer home, in the Aegean lands, the patient exploration of early sites, in many cases of huge stratified mounds, the unearthing of buried buildings, the opening of tombs and the research of minor objects have reconstituted the successive stages of whole fabrics of former civilizations the very existence of which was formerly unsuspected.

"The investigations of a brilliant band of prehistoric archaeologists, with the aid of representatives of the sister sciences of geology and paleontology, have brought together such a mass of striking material as to place the evolution of human art and appliances in the last quarter of a period on a far higher level than had been even suspected previously. Following in the footsteps of Letart, and after him "Briart and Pictet, Prof. Cartailhac, and others, the Aegean world, in its earlier and later phases, has revolutionized our knowledge of a phase of human culture which goes so far back beyond the limits of any continuous story that it may well be said to belong to an older world.

"The engraved and sculptured marks of man in the Neander period have now to add not only such old specialties as are exemplified by the moulded clay figures of life size found in the Tuc d'Audoubert Cave, or the similar high reliefs of a procession of six horses cut on the overhanging limestone of Cap Blanc, but whole galleries of painted designs on the walls of caverns and rock shelters.

"So astonishing was this last discovery, made first by the Spanish investigator, Senor de Santuana—or, as he is called, the "Cave of the Sorcerer"—that it was not until after it had been corroborated by repeated finds on the French side of the Pyrenees—not, indeed, until the beginning of the present century—that the prehistoric age of these rock paintings was generally recognized. The greatest marvel of all is that such potent mystic powers as the power of standing and couching, or with limbs huddled together, of the Altamira

Will Science Graft Human Organs? What Has Been Accomplished

By DR. G. THESING OF LEIPSIG.

FROM ancient times gardeners have improved the character of plants by grafting, thus increasing the yield or bettering the quality of fruits. In grafting the shoots are planted on the stems of other plants and actually become part and parcel of the stem.

The grafting has been so widespread that we are tempted to forget how wonderful the process is. It is only when we encounter numerous failures, and as we know remarkably successful grafting. It has been demonstrated that a human arm can be grafted on a dog's stem. The explanation is given in the text and the picture are all in place.

What applies to plants applies in a lesser degree to animals. Experiments have proved that the blood of one species of animals affects the blood of another species of animals. The blood of one animal is rejected by the blood of another animal of a different species. The blood of one animal is rejected by the blood of another animal of a different species. The blood of one animal is rejected by the blood of another animal of a different species.

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When the child is six months old or more the milk diet may be supplemented with strained vegetable soup, potato purée, fruit juices and fresh meat juices. On account of its poor vitamin constitution the young child thus affected should get little in the shape of four foods.



Wonderful group of paintings done by man of the older Stone Age, discovered by a little girl on the roof of a cave in Spain. At right—Cretan seal, showing a Cretan worshipping a goddess; note the costume of the goddess with all its flourishes

"The evidence of Homer itself is conclusive. Arms and armor described in the poems are those of the Minoan country or people. Many are the tongues of mortal men, its votaries, like the immortals, speak a single language. Throughout the whole vast area illumined by its quickening rays, its workers are interdependent and pledged to a common cause."

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